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CRUISE REPORT

NOAA R/V John N. Cobb
Cruise No. JC-87-04
11 May - 6 August 1987

The NOAA R/V John N. Cobb completed an 89 day cruise from May to August 1987 in Southeast Alaska in support of groundfish fisheries research by the Northwest and Alaska Fisheries Research Center. The cruise supported four studies: 1) longline gear experiments for sablefish, 2) comparison of catches of sablefish in slope and gully areas, 3) oceanography of the Sitka Gyre, and 4) sampling Pacific ocean perch. Survey results of studies 1, 2, and 4 are given in this cruise report. Results from study 3 were inconclusive and no report will be distributed for that study.

This Cruise Report is a compilation of two reports, one report on studies 1 and 2, and another report on study 4. The reports are summaries of each study. For more information about each report contact Evan Haynes, Northwest and Alaska Fisheries Center Auke Bay Laboratory, National Marine Fisheries Service, NOAA, P.O. Box 210155, Auke Bay, Alaska 99821.

Report No. 1.

OBJECTIVES

1. Assess the effect of soak time on sablefish catches using longline gear.

2. Compare sablefish catches in gullies and adjacent slope areas.

GEAR AND FISHING METHODS

Longline gear rigged with circle hooks was fished. Each skate was 366 m (200 fm) in length with 176 hooks attached. The groundline was 0.8 cm (5/16 in) leaded poly. Beckets spaced 2 m (6.5 ft) apart were "stuck" into the groundline. A 38 cm (15 in) gangion was tied onto each becket, with an Eagle Claw 7/0 circle hook on the end of each gangion. The gangions were tied from 66 cm (26 in) sections of gangion material. Gangion material was stiff lay #48 thread and becket material was medium lay #60 thread.

Six to nine skates of gear was fished each day in sets of three skates. A lead line (groundline without hooks) 137 to 183 m (75 to 100 fm) in length was tied to each end of the set and was anchored with 31 to 40 kg (70 to 90 lb) of chain. Buoy lines also was 0.8 cm (5/16 in) leaded poly. Hooks were hand baited with chopped herring at a rate of 11.3 kg (25 lb) per 100 hooks and set from circular plastic tubs, 46 cm (18 in) high by 61 cm (24 in) in diameter.

SCIENTIFIC METHODS

Soak time experiment

Soak time for the longline gear on the domestic longline survey ranged from three to seven hours. Thus catches varied to differences in abundance from area to area and soak time along the longline. Soak time experiments were conducted to develop a soak time correction factor that will account for variability in catches due to soak time. This correction factor will be used to standardize catches from the domestic longline survey to a standard soak time.

In 1986, soak time experiments were conducted in two areas, Chatham Strait near Tenakee Inlet and Icy Strait south of Home shore. Two longline sets were made each day. One set soaked three hours; the other set soaked seven hours. (Soak time equals the difference between the time setting of the longline ends and the time hauling of the longline begins.) Catches at both sites were relatively high and soak time had little effect on sablefish catches at both sites. In these two areas where sablefish abundance was relatively high, the longline gear apparently was effectively saturated with sablefish within 3 hours. In areas where sablefish abundance is relatively low, sufficient baited hooks may continue to be available throughout the longer soak time and in these areas soak time may have an effect on sablefish catches. This year, fishing operations were conducted in an area of relatively low sablefish abundance, Stikine Strait near Wrangell, Alaska.

Two longline sets were made each day in Stikine Strait. Each set consisted of three skates with hooks spaced two meters apart. One set soaked three hours; the other set soaked seven hours. The time was recorded at the start of haulback, as the first hook came aboard, at the end of each 50 fathom length of groundline, and at the end of haulback. Catch by species was recorded. Baited, unbaited, and broken or tangled hooks were tallied. Viable sablefish were tagged and released.

The soak time experiment began May 11 and lasted until May 31. Fishing operations were conducted in Stikine Strait near Wrangell, Alaska. 3,463 sablefish were caught in 37 sets, 3,212 of the sablefish were tagged. Ninety-four percent of the sable-fish caught were less than 55 cm FL. The catch rate in Stikine

Strait was relatively low, averaging 16 sablefish per 100 hooks fished after three hours. Soak time had little effect on sablefish catches. Sablefish catches were only 13% higher for the seven hour soak time compared to the three hour soak time. Expressed a different way, 89% of the sablefish were caught in the first three hours of the seven hour soak time sets. Thus, even where sablefish abundance was relatively low, soak time had little effect on the sablefish catch rate.

Experimental gully survey

Gully areas in the Gulf of Alaska (Shelikof Trough, Amatuli Trough and other nearby gullies, the W-grounds, Yakutat Canyon, Alsek Strath, Spencer Gully, Ommaney Trench, and Dixon Entrance) have not been surveyed by longlines since the only Gulf-wide longline survey, the Japan - U. S. cooperative longline survey is confined to the continental slope. At least some of these gully areas are commercially productive fishing grounds, e.g. Spencer Gully. The methods used to analyze the results of the Japan - U.S. cooperative longline survey currently assume that the catches in gully areas are similar to catches in nearby slope areas. The purpose of the experimental gully survey was to test this assumption.

Fishing operations were conducted at two areas, the Ommaney Trench area of the southern tip of Baranof Island, Alaska and the Spencer Gully area of the western shore of Chichagof Island, Alaska. Two sets were made each day at Ommaney Trench and each set soaked three hours. Three sets were made each day at Spencer Gully and the first set soaked three hours, the second set soaked four hours, and the third set soaked five hours. In each area, the gully was fished one day and the adjacent slope was fished the following day. The data recording procedure was identical to the procedure used in the soak time experiment. Viable sablefish were tagged and released.

The comparison of sablefish catches in gullies and adjacent slope areas was conducted from June 3 to 12 in the Ommaney Trench area. 1,576 sablefish were caught in 9 sets, 1,517 of the sablefish were tagged. The catch rate was relatively high, averaging 34 sablefish per 100 hooks fished and reaching as high as 54 sablefish per 100 hooks fished. The sablefish catch rate in the gully area was twice as high as the sablefish catch rate in the adjacent slope area.

The comparison of sablefish catches in gullies and adjacent slope areas was conducted from June 14 to 29 in the Spencer Gully area. 3,878 sablefish were caught in 23 sets, 3,361 sablefish were tagged. The catch rate was relatively high, averaging 34 sablefish per 100 hooks fished. In the Spencer Gully area, unlike in the Ommaney Trench area, the sablefish catch rate in the gully area was about the same as the sablefish catch rate in the slope area.

SCIENTIFIC PERSONNEL

Leg I: May 11-June 1, Juneau to Sitka

Mike Sigler, Chief scientist
Evan Haynes
Nancy Maloney

Leg II: June 3-13, Sitka to Juneau

Mike Sigler, Chief scientist
Mike Dahlberg
Ellen Varosi

Leg III: June 16-30, Juneau to Juneau

John Karinen, Chief scientist
Ellen Varosi
Peggy Murphy

Report No. 2

OBJECTIVES

1. Describe daytime and nighttime distributions of POP aggregations.

2. Determine if POP can be sampled using a midwater trawl.

3. Determine the application of sonar echosounding for monitoring the abundance of POP.

4. Determine if POP are associated with euphausiid layers.

ITINERARY

July	16	Install 105 kHz acoustic system on R/V _John N. Cobb_ in Auke Bay.
	17	Test 105 kHz acoustic system in Auke Bay.
	18	Travel to Glacier Bay and conduct acoustic surveys on humpback whale prey.
	19	Sample humpback whale prey in Icy Strait.
	20	Install 120 kHz and 38 kHz acoustic systems on _John N. Cobb_ in Auke Bay.

	21	Test acoustic system and bottom trawl in Lynn Canal.
	22	Travel to Juneau and supply vessel with fuel, water and food.
	23	Travel to outer coast of Southeast Alaska.
	24	Survey off Cape Bartolome and midwater trawl for rockfish and zooplankton.
	25	Survey off Cape Bartolome, midwater trawl and jig for rockfish.
	26	Survey off Cape Bartolome, midwater trawl and jig for rockfish.
	27	Travel to Cape Ommaney, survey area, midwater trawl and bottom trawl rockfish.
	28	Survey off Cape Ommaney, midwater trawl and bottom trawl rockfish.
	29	Survey off Cape Ommaney, midwater trawl and bottom trawl rockfish.
	30	Survey off Cape Ommaney, sample euphausiids, run to Sitka Sound area, midwater trawl and bottom trawl rockfish.
	31	Survey off Sitka Sound, midwater trawl and bottom trawl rockfish.
Aug.	1	Survey off Sitka Sound, midwater trawl and bottom trawl rockfish, run to Sitka.
	2	Depart Sitka, sample juvenile sablefish in St. John Baptist Bay, travel to Salisbury Sound, survey and bottom trawl rockfish.
	3	Survey off Salisbury Sound, midwater trawl and bottom trawl rockfish.
	4	Travel to Whale Bay and rig alternative bottom trawl.
	5	Travel to Auke Bay because of electrical problems with John N. Cobb steering system.
	6	Off load equipment in Auke Bay, travel to Juneau.
	7	Off load equipment in Juneau, underway to Seattle.

EQUIPMENT

Sampling Gear

Trawl gear included two bottom fish trawls, two midwater fish trawls, and one midwater zooplankton trawl. Bottom trawls were a 400-mesh Eastern otter trawl and a high rise Aberdeen trawl; the Aberdeen trawl was a backup net and not used during this cruise. The opening of the Eastern otter trawl was approximately 13 m horizontally and 2 m vertically. The midwater fish trawls were a 10 m modified herring trawl and a 19 m shrimp sampling trawl. Horizontal openings of the midwater trawls were approximately 6 m and vertical openings were between 2-3 m. A Furuno netsounder was used on the midwater trawls to monitor position of the net with respect to surface, bottom, and acoustic targets. Both the bottom and midwater trawls used 5' X 7' vee doors weighing 372 kg each. The midwater zooplankton trawl was a 0.5 m opening Tucker Trawl with 1-mm mesh net.

Sonar Equipment

A dual frequency, dual beam Biosonics 102 echosounder was used to survey fish and zooplankton. The echosounder operated at frequencies of 38 kHz and 120 kHz, with narrow (10°) and wide (25°) beam angles for each frequency. Equipment for analyzing and recording data included an integrator for converting reflected sound energy to density estimates, a microcomputer for storing the integrated data on floppy diskettes, a graphic recorder to provide visual recordings of the intensity and depth distribution of acoustic targets, and an audio-digital processor and video-cassette recorder for storing digitized data that could be reprocessed through the integrator and chart recorder. In addition to the Biosonics echosounder, the vessel's 38 kHz Simrad IQ echosounder was used for recording fish echosignal.

METHODS

The two main regions chosen for POP research were the outer continental shelf and upper continental slope off Cape Bartolome and Cape Ommaney. These regions were chosen because they contained POP concentrations. Off Cape Bartolome, a Canadian research vessel documented an aggregation of POP covering >10 square miles in 1983, and the Cape Ommaney area has consistently produced large catches of POP during bottom trawl surveys in the 1970's and 1980's.

Rockfish aggregations and euphausiid layers were located with sonar echosounding, and species composition determined by sampling with trawls. The distribution of POP and other rockfish were determined with 38 kHz echosounding and the distributions of both euphausiid layers and rockfish determined with 120 kHz echosounding. Echosounding was conducted along a transect pattern that covered depths from 150-300 m along the outer continental shelf and upper continental slope off Cape Bartolome and Cape Ommaney. The transects were 1 mile apart and extended 20 miles along the 200 m contour. The experimental design was to (a) record horizontal and vertical distributions of fish targets and zooplankton layers along the transects using echosounding, (b) sample fish targets and zooplankton layers to identify POP aggregations and euphausiid layers and (c) monitor large aggregations of POP for continuous 24 h periods, documenting changes in their vertical and horizontal distributions.

All POP from bottom trawl catches were sorted into baskets and subsampled for size composition, sex, and age composition. Otoliths were collected from large samples of adult POP to determine if strong year classes had recruited into the population. Juvenile POP were collected for establishing length/age relationships.

RESULTS

Cape Bartolome

Fish aggregations were located off Cape Bartolome both day and night. During the day, fish were mainly in small aggregations on or near the bottom (Fig. 1a). At night, a continuous layer of fish was dispersed over the bottom at the shelf break (Fig. 1b). Six midwater trawl hauls, three each at day and night, targeted the fish echosignal, but no fish were captured. Bottom trawls were not set in the Cape Bartolome region, but POP and several other species of rockfish were caught near the bottom with a jigging machine.

Dense zooplankton layers were found near the shelf break off Cape Bartolome (Fig. 1a). These layers were 10-60 m thick and were usually found within 40 m of the bottom. The zooplankton were sampled using the fish midwater trawl which captured thousands of *Thysanoessa spinifera* in the meshes of the net and cod end each time the trawl passed through a layer. The euphausiids migrated to the surface at dusk, remained near the surface at night (Fig. 1b), and migrated back to near bottom at daybreak.

Cape Ommaney

Distributions of fish targets off Cape Ommaney were similar to fish targets off Cape Bartolome; daytime targets were in small aggregates on or near the bottom and nighttime targets were layered from the bottom to 30 m above the bottom (Fig. 2). Eight bottom trawl hauls and thirteen midwater trawls were completed in the Cape Ommaney area. Midwater trawls were again unsuccessful, but POP were caught in all bottom trawl hauls (Table 1). Two of the hauls were made at depths between 188 - 198 m and yielded only small catches of POP (65 and 22 kg). Most of the POP in these shallow hauls were juveniles. The remaining six hauls were at depths >205 m and yielded large catches of POP (646-5148 kg). Most of the POP in the deeper hauls were adults.

POP appeared to be more vulnerable to bottom trawls at night. Two night hauls were made in the same vicinity as two of the daytime hauls, and both the catch rates and percent composition of POP increased at night. POP catches doubled at night and percent composition of POP increased from 60% during the day to 88% during the night.

Dense zooplankton layers were found above the shelf break off Cape Ommaney (Fig. 2a). These layers were sampled with a Tucker trawl equipped with a net monitor. Euphausiia pacifica was the main component of the zooplankton layers.

Sitka Sound to Cross Sound

In addition to the two main study sites, POP were sampled at five sites north of Cape Ommaney. The sites were about 20 miles apart. Five midwater trawl hauls were completed and no fish were captured except when the trawl touched bottom. Seven bottom trawl hauls were completed and POP were captured in six of the bottom hauls (Table 1). POP catches were <150 kg for the three hauls at depths <200 m. At depths from 200-311 m, POP catches ranged from 204-1112 kg. One trawl was made deeper than 350 m and only four POP were captured.

Comparison of echosounding and POP catches

POP catch rates varied considerably for six bottom trawls set within three miles of each other at similar depths in the Cape Ommaney area. These variations in catch rates can be at least partially explained by the location of fish echosignal observed during the trawl hauls. When no aggregations of fish were detected on or near the bottom, catch of POP was low (646 kg) (Fig. 3a). When fish aggregations were detected on or near the bottom, catches of POP were relatively high (1987 kg and 2756 kg; Fig. 3b,c). Aggregations of fish that were detected mainly above bottom, resulted in low catches of POP (689 kg; Fig. 3d).

Nighttime distribution of fish targets were similar at all sites, but differences were observed in the intensity of the nighttime echosignal. These differences in intensity of the nighttime echosignal were reflected in the catch rates. For instance, the echosignal was considerably more dense when 5148 kg of POP was caught (Fig. 4a) than when 1339 kg of POP was caught (Fig. 4b).

Euphausiid layers were not continuous along the outer southeastern coast, but were found in specific areas that included Cape Ommaney and Cape Bartolome. The layers were most dense near the shelf break and were present at all sites producing large catches of POP.

COMMENTS ON POP STUDY

The midwater trawls used in this study were not capable of capturing off bottom fish. The positive relationship between echosignal and bottom trawl catches, however, indicates that most near bottom fish echosignal was caused by POP. During the day, fish echosignal consisted mainly of small aggregations and large catches of POP occurred when these aggregations were in contact with the bottom. Small POP catches occurred when aggregations were absent or located off bottom. Daytime catches of POP appeared to decrease when aggregations moved upward in the water column. At night, fish dispersed uniformly over the upper steep slope. More POP were captured when the echosignal was most dense, indicating the echosignal was caused by POP. POP catches also increased at night indicating they were more vulnerable to bottom trawls at night than during the day.

Dense layers of euphausiids were concentrated over the outer continental shelf and upper continental slope where POP were most abundant. Although euphausiid layers were not continuous along the coast, they were found at all sites that produced large catches of POP. POP captured during this study were feeding almost exclusively on euphausiids. Euphausiid-rich areas, therefore, may be an important factor for determining POP distribution patterns.

Catch rates of POP were related to depth. Adult POP comprised >50% of the catch at depths between 200-310 m. At depths between 170-200 m, POP catches averaged only 11% of the total catch and most of the POP were juveniles. One trawl at >350 m depth had only 2% POP.

Preliminary results from this study indicate that sonar echosounding may be useful for monitoring abundance of POP. If the fish that dispersed off bottom are POP, they can be quantified using hydroacoustics. Attempts will be made in 1988 to identify off bottom fish targets using a midwater rope trawl designed to capture rockfish, and possibly a manned submersible and underwater video. POP distributions and euphausiid layers appear to be related, and echosounding studies will continue in 1988 to define these relationships.

SECONDARY STUDIES

Prior to the POP study, the R/V John. N. Cobb was used to assess whale prey in Glacier Bay. Assessment of whale prey using hydroacoustics is part of a cooperative study with the National Park Service that started in 1982. Prey information is used to interpret whale movement patterns in Glacier Bay. In addition to the surveys, whale prey was sampled with a midwater trawl at a site where 5 - 10 whales were feeding. Herring were captured at the site and samples of the herring were retained for aging by Alaska Department of Fish and Game.

In addition to hydroacoustic studies, sablefish were collected for laboratory experiments, stomach analysis, and tagging studies. Adult sablefish were captured in Lynn Canal with bottom trawls and transferred in live tanks to the Auke Bay Laboratory. These fish were used to determine accumulation rates of tributyltin. Stomachs of adult sablefish were collected as part of an ongoing study to describe their seasonal foods in different regions of southeastern Alaska. Adult sablefish stomachs were obtained from bottom trawl catches that targeted rockfish. Juvenile sablefish were captured in St. John Baptist Bay near Sitka as part of an ongoing study to describe their migration patterns, growth, and feeding. Using herring jigs, thirty-five juvenile sablefish were captured that had been tagged in 1985 and 1986, and an additional twenty-nine untagged sablefish were caught. Ten of the untagged sablefish were retained for stomach samples and nineteen were tagged. All tagged sablefish were released after recording their length and tag number.

PERSONNEL

July 17-19 Glacier Bay

Kenneth Krieger, Chief Scientist	Fisheries Biologist
Ellen Varosi	Fisheries Technician
Kathy Herndon	Fisheries Biologist

July 21 Lynn Canal

Kenneth Krieger, Chief Scientist	Fisheries Biologist
George Snyder	Laboratory Director

July 23-August 6

Kenneth Krieger	Fisheries Biologist
Jeff Fujioka	Fisheries Biometrician
Dick Haight	Fisheries Biologist

Table 1. Bottom fish catches off southeastern Alaska coast during July and August, 1987.

Date	Area	Latitude start stop	Longitude start stop	Gear depth m	Haul time start stop	Catch (kg)/30 min Total	POP	rockfish	flatfish	other
July 27	Cape Ommaney	56 17.4 56 16.4	135 30.3 135 30.0	205-209	0853 0913	1467	646	71	347	403
July 27	Cape Ommaney	56 16.4 56 16.4	135 31.8 135 31.9	214-269	1558 1608	2799	1987	532	224	56
July 27	Cape Ommaney	56 16.2 56 16.2	135 31.5 135 3.5	219-232	2331 2341	5477	5148	164	55	110
July 28	Cape Ommaney	56 15.2 56 15.2	135 31.0 135 31.1	243-251	1458 1508	3402	2756	408	204	34
July 28	Cape Ommaney	56 19.1 56 18.1	135 33.3 135 32.1	243-249	1659 1708	1377	689	124	468	96
July 28	Cape Ommaney	56 19.1 56 18.4	135 33.4 135 33.1	218-220	2255 2305	1633	1339	114	98	82
July 29	Cape Ommaney	56 15.1 56 15.4	135 23.0 135 23.3	192-198	1847 1857	650	65	422	150	13
July 29	Cape Ommaney	56 18.1 56 17.3	135 24.5 135 25.5	188-192	2015 2025	187	22	118	28	19
July 30	Necker Is.	56 40.0 56 39.5	135 47.4 135 46.3	207-219	1817 1827	727	204	160	196	167
July 31	Sitka Sound	56 55.1 56 55.0	135 57.4 135 58.0	188-190	0747 0750	1588	32	16	1397	143
July 31	Salisbury Sound	57 15.1 57 15.2	136 16.5 136 12.0	293-311	1654 1700	4834	1112	3190	242	290

Table 1 (Continued). Bottom fish catches off southeastern Alaska coast during July and August, 1987.

Date	Area	Latitude start stop	Longitude start stop	Gear depth m	Haul time start stop	Catch (kg)/30 min Total	POP	rockfish	flatfish	other
Aug. 1	Salisbury Sound	57 13.2 57 13.0	136 09.5 136 09.4	188-189	1736 0741	10886	0	0	10886	0
Aug. 2	Pt. Theodore	57 50.5 57 50.0	136 51.0 136 50.5	229-256	1645 1650	863	259	164	250	190
Aug. 3	Pt. Theodore	57 52.0 57 52.2	136 49.5 136 49.3	176-177	0727 0732	546	147	38	366	5
Aug. 3	Cross Sound	58 00.3 58 00.1	136 47.5 136 47.3	355-357	0904 0909	612	12	6	110	484

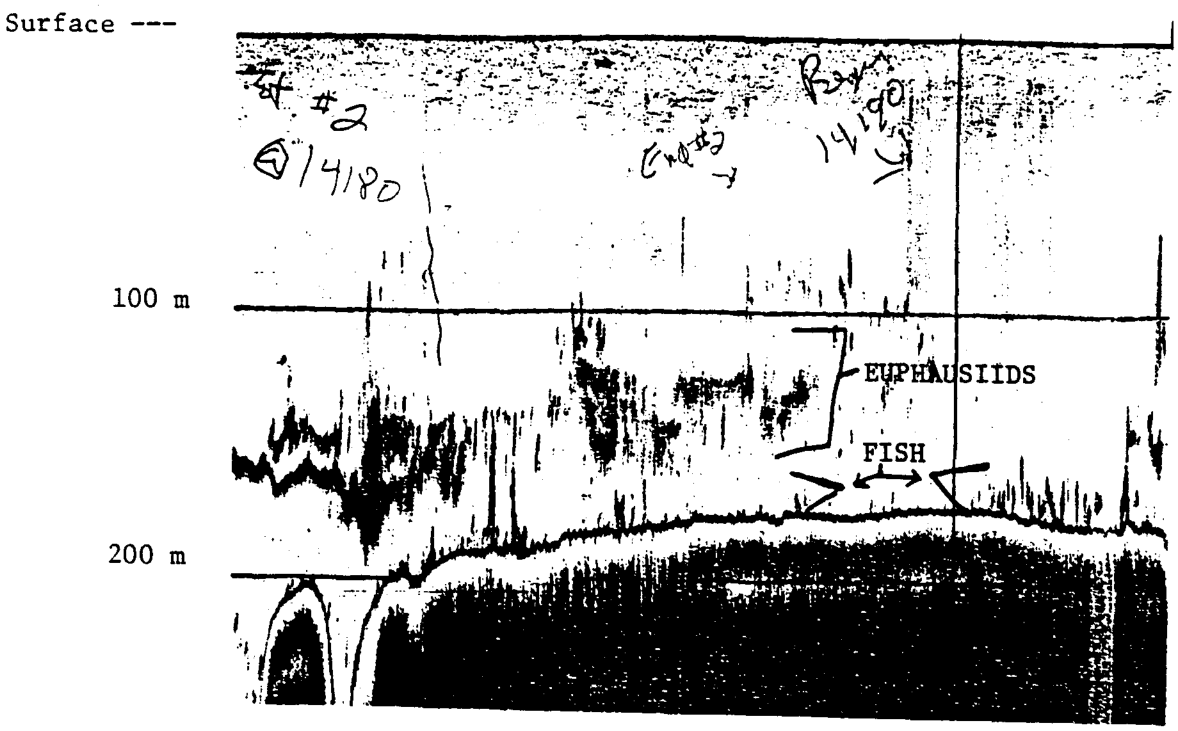


Figure 1a. Echogram of daytime distribution of fish and euphausiids off Cape Bartolome.

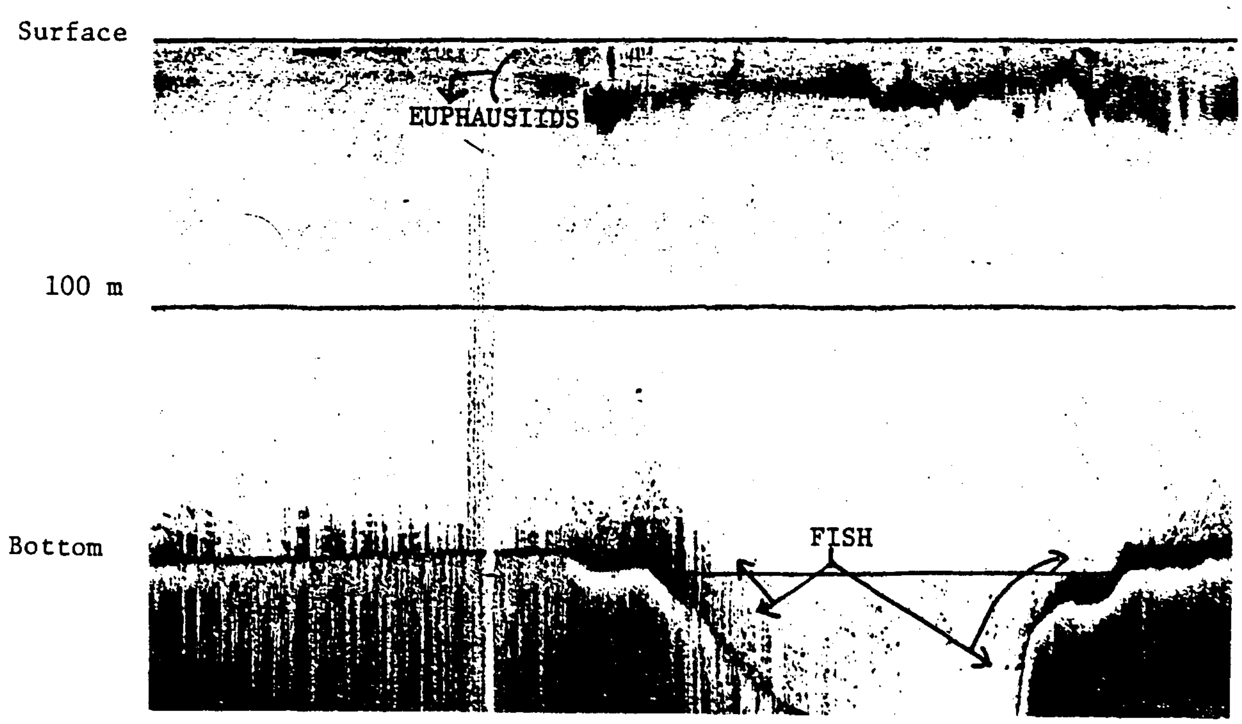


Figure 1b. Echogram of nighttime distribution of fish and euphausiids off Cape Bartolome.

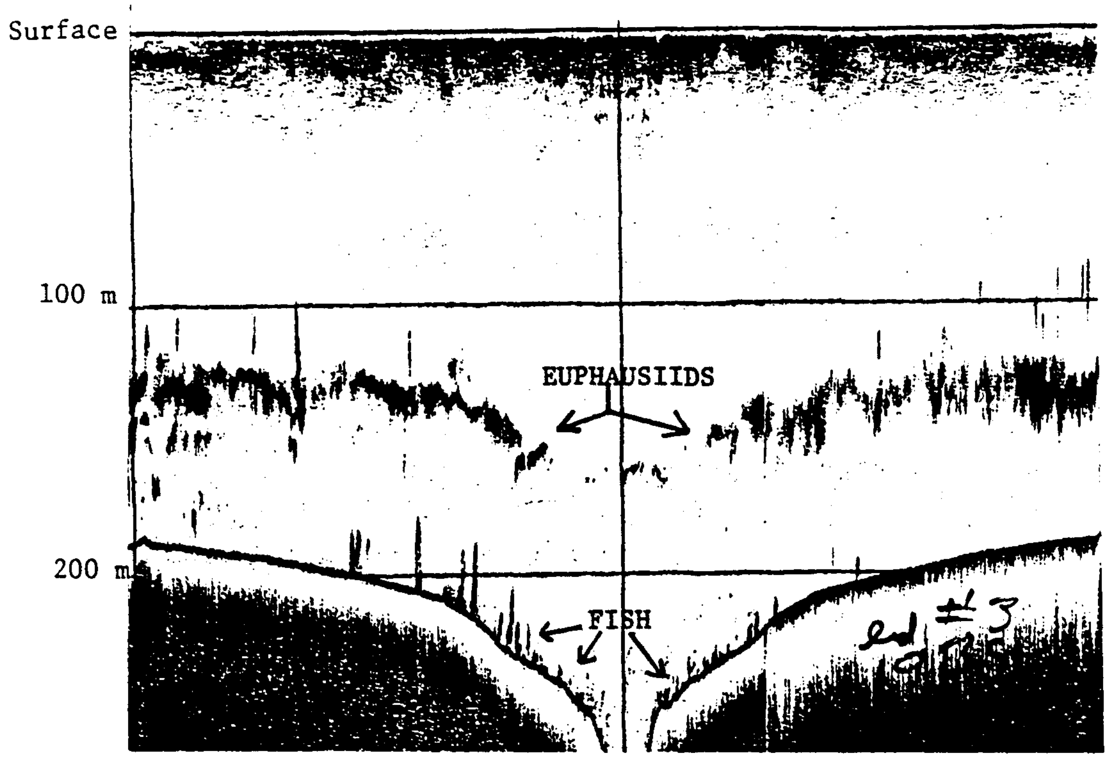


Figure 2a. Echogram of daytime distribution of fish and euphausiids off Cape Ommaney.

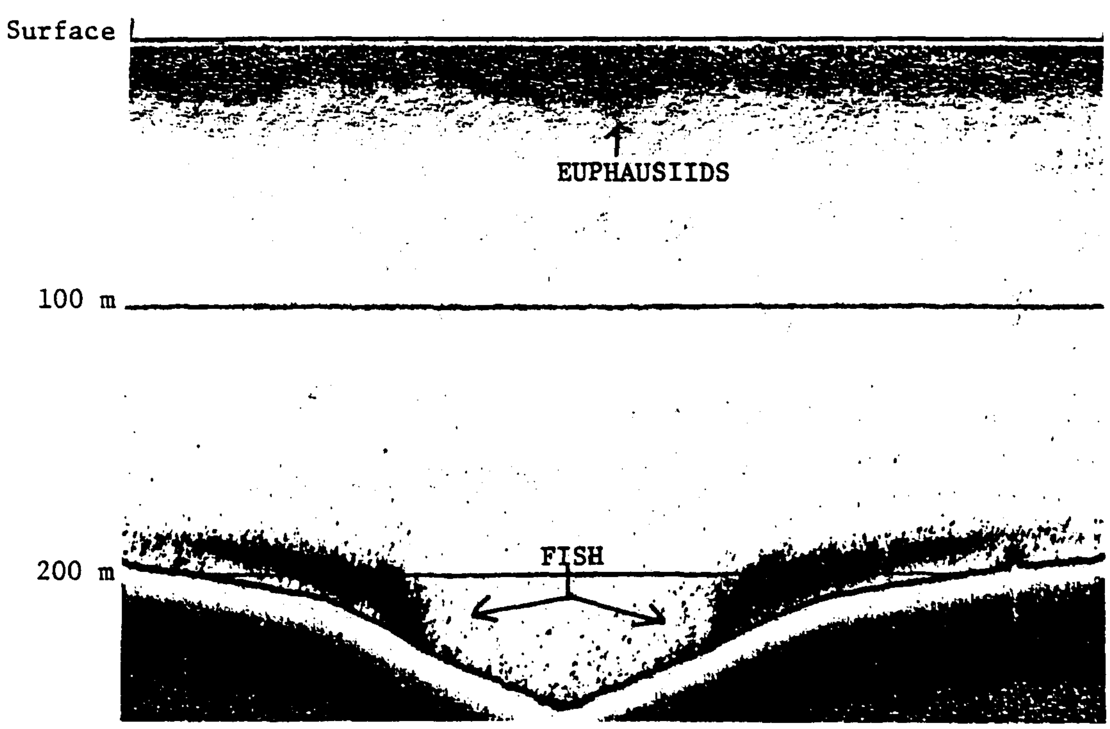
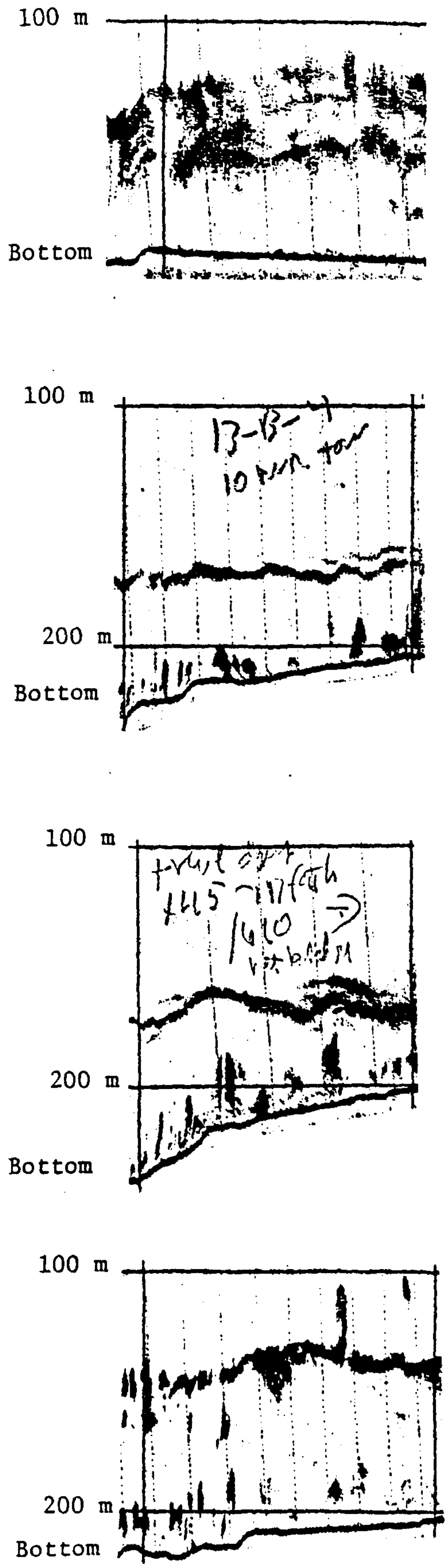


Figure 2b. Echogram of nighttime distribution of fish and euphausiids off Cape Ommaney.



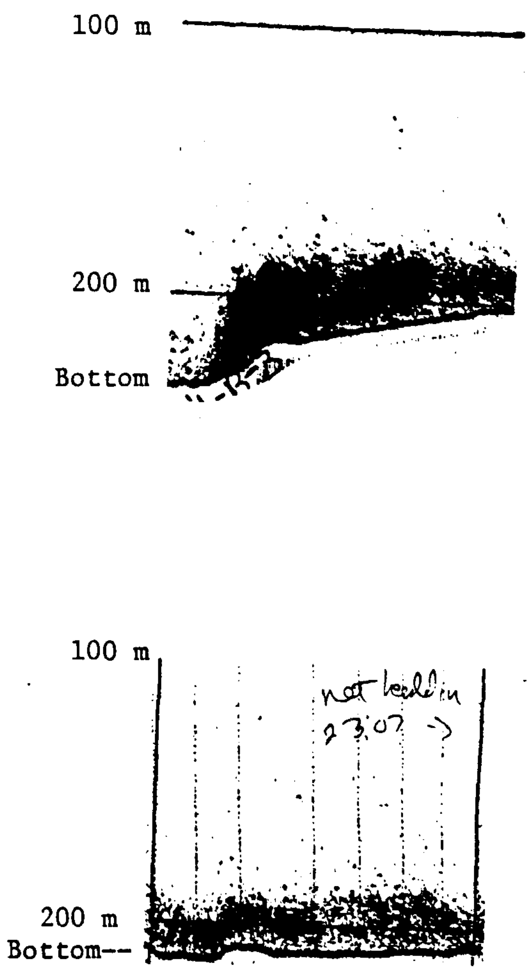
a: No fish aggregations on or near bottom. 646 kg of POP captured.

b: Fish aggregation on or near bottom. 2756 kg of POP captured.

c: Fish aggregations on or near bottom. 1987 kg of POP captured.

d: Fish aggregations above bottom. 689 kg of POP captured.

Figure 3. Echograms of fish distribution along daytime bottom trawl paths off Cape Ommaney.



a: Echosignal density where 5148 kg of POP were captured.

b: Echosignal density where 1399 kg of POP were captured.

Figure 4. Echograms of fish distribution along nighttime bottom trawl paths off Cape Ommaney.